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<p>(21) International Application Number: PCT/NL00/00100</p> <p>(22) International Filing Date: 17 February 2000 (17.02.00)</p> <p>(30) Priority Data: 1011347 19 February 1999 (19.02.99) NL</p> <p>(71) Applicant (for all designated States except US): B & B BULBS & FLOWERS B.V. [NL/NL]; De Ruil 3, NL-1693 HD Wervershoof (NL).</p> <p>(72) Inventors; and (75) Inventors/Applicants (for US only): BOOS, Marcellinus, Maria [NL/NL]; Kalverstraat 2, NL-1693 BS Wervershoof (NL). KAPPELHOF, Rudolfus, Jacobus, Maria [NL/NL]; Bannestraat 17, NL-1693 EX Wervershoof (NL).</p> <p>(74) Agent: HOOIVELD, Arjen, Jan, Winfried; Arnold & Siedsma, Sweelinckplein 1, NL-2517 GK The Hague (NL).</p>		<p>(81) Designated States: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).</p> <p>Published <i>With international search report.</i> <i>In English translation (filed in Dutch).</i></p>
<p>(54) Title: CULTIVATION TRAY</p> <div data-bbox="422 1155 1169 1701"> </div> <p>(57) Abstract</p> <p>A cultivation tray (1) for cultivating breeding material such as seeds, bulbs, cuttings, plants or the like, using a growth medium, which cultivation tray (1) comprises at least one downwardly narrowing through hole (2) for containing the breeding material therein, a specific feature of which is the fact that at least the wall of the hole (2) is made of such plastic material that the material to be cultivated can be clampingly received in the hole (2), at least substantially without being damaged, by local deformation of the wall, whilst the wall is at least substantially impenetrable to roots of the material to be cultivated.</p>		

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CULTIVATION TRAY

The invention relates to a cultivation tray for cultivating breeding material such as seeds, bulbs, cuttings, plants or the like, using a growth medium, which cultivation tray comprises at least one downwardly narrowing through hole for containing the breeding material therein. The invention in particular relates to a cultivation tray for cultivating bulbous plants in water in which nutrients or the like may be present. Such being the case, for the sake of simplicity, the term "bulb(s)" will be used hereafter rather than "breeding material", and "water" rather than "growth medium", although it is expressly noted that the terms that will be used hereafter must not be construed to be limitative.

A cultivation tray of this kind is known from international (PCT) patent publication No. PCT/SE96/00496 (Perstorp AB). This cultivation tray in the form of a floating tray made of a hard plastic by means of an injection moulding process includes several conical openings for containing cuttings and the like therein, for example. Since the hard plastic of polymeric material that has been selected as the starting material has a specific weight approximately equal to or greater than 1 g/cm³, the prior art floating tray comprises so-called "air cushions" in order to obtain the required buoyancy. Said "air cushions" are made up of cavities which are filled with air in use, which cavities are bounded by the water surface and by the floating tray itself.

One drawback of the floating tray which is known from the aforesaid international patent specification is that the plastic material that is used for forming same is very hard, as a result of which in particular bulbs are easily damaged upon being pressed into the conical

holes. Obviously this has adverse consequences as regards the quality of the product that is eventually cultivated.

- 5 The object of the invention is to overcome the drawback of the prior art, more in particular to provide a cultivation tray by means of which in particular bulbous plants can be cultivated at a high quality level without causing damage to the plants.

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- In order to accomplish that objective, a cultivation tray of the kind referred to in the introduction is characterized in that at least the wall of the hole is made of such plastic material that the material to be
15 cultivated can be clampingly received in the hole, at least substantially without being damaged, by local deformation of the wall, whilst the wall is at least substantially impenetrable to roots of the material to be cultivated. Preferably, the entire cultivation tray
20 is homogeneously formed of such plastic material. In this connection, the term plastic material is meant to include rubber material as well. Thus it is possible at all times to set the bulbs in a correct position, that is, with their root system just immersed in the water
25 that functions as the nutrient medium, preferably by mechanical means, without causing damage thereto. Since the plastic material being used is impenetrable to roots, cultivated products can easily be harvested from the cultivation tray, whilst the cultivation tray is
30 furthermore suitable for reuse.

- In one preferred embodiment of a cultivation tray according to the invention, the plastic material is polystyrene $(\text{CHCH}_2\text{CHCH}_2\text{CHCH}_2)_n$, in particular having a
35 volume weight of 20 - 100 g/l, more in particular 40 - 60 g/l, even more in particular about 45 g/l. Extensive experimenting has shown that the material having this

composition is pre-eminently suitable to meet the, seemingly contradictory, requirements of the present invention: "sufficiently soft" for clampingly positioning the bulbs without causing damage thereto, as
5 well as "sufficiently hard" to prevent roots penetrating therein.

In another preferred embodiment of a cultivation tray according to the invention, said at least one hole is
10 conical. This contributes to the multi-functionality of the cultivation tray, so that bulbs of different sizes can still be effectively cultivated therein.

In another preferred embodiment of a cultivation tray
15 according to the invention, the cultivation tray is provided with several holes, preferably 100 - 400 per m² (irises), 250 - 600 per m² (tulips), 50 - 250 per m² (lilies). Extensive experimenting has shown that the ideal "density" as regards the holes depends on the type
20 of material to be cultivated (bulbous plants), since some bulbous plants, for example irises, require more (side)light, among other things, than other bulbous plants.

25 In another preferred embodiment of a cultivation tray according to the invention the specific weight of the cultivation tray is < 1 g/cm³. This makes it possible to use the present cultivation tray as a floating tray.

30 In another preferred embodiment of a cultivation tray according to the invention said cultivation tray comprises at least one rib extending from the underside of the cultivation tray. Preferably, the present cultivation tray is provided with such a rib along its
35 circumferential edge and/or between rows of holes. This is conducive not only to the stiffness of the cultivation tray and to the stability thereof on a

supporting surface, but it also prevents the root system of the bulbs from being damaged, in particular when a plant setting machine is used. The fact is that the plant setting machine will not crush the root system on the supporting surface in that case. Furthermore the water level can be precisely determined by means of the level of the water along the projecting rib(s), so as to ensure that the bulbs are optimally positioned in the water with their root system.

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In another preferred embodiment of a cultivation tray according to the invention, the cultivation tray is suitable for the cultivation of lilies and/or hyacinths when turned upside down, in which position said at least one hole widens in downward direction. This will be explained in more detail in the description of the figures.

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The invention will be explained in more detail hereafter by means of a preferred variant of the invention, wherein reference is made to figures illustrated in a drawing, in which:

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- Figures 1 is a schematic top plan view and Figures 2 and 3 are schematic side views of a cultivation tray according to the invention; and

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- Figure 4 schematically shows in perspective view (a) and in cross-sectional view (b) a box-shaped water reservoir used with the cultivation tray according to Figures 1 and 2.

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Figures 1 and 2 show a rectangular cultivation tray 1 made of a homogeneous polystyrene, in which a total of sixty downwardly narrowing (conical) through holes 2 are formed. The polystyrene, which is also designated "E.P.S." or "styropor" in practice, preferably has the

aforesaid chemical composition, so that in particular bulbs of plants such as irises and tulips and the like, one bulb 3 of which is schematically shown in Figure 3, can be clampingly inserted, and that without being
5 damaged, into said holes with their root system 4 just immersed in an underlying growth medium (preferably water, to which nutrients and anti-infection agents have been added). The polystyrene is at the same time sufficiently hard to be impenetrable to growing roots.
10 This makes it easier to harvest cultivated products and it makes the cultivation tray 1 suitable for reuse. The clamping down of bulbs 3 in the conical holes 2 takes place by local deformation of the polystyrene, so that said plastic comprises a certain flexibility, as it
15 were. The whole is furthermore provided with downwardly projecting ribs 5 (illustrated in dotted lines in Figure 1), which rest on a supporting surface in use. Ribs 5 not only enhance the rigidity and the stability of the cultivation tray 1, but they also enable precise
20 determination of the water level in a water reservoir in which the cultivation tray 1 is placed as a floating tray by means of the water level along ribs 5. This latter aspect is important in order to ensure that the root system 4 of the bulbs 3 is sufficiently immersed in
25 the water at all times.

Preferably a thickening 13 is provided, as shown in Figure 2, which thickening is formed on the wall of the conical holes 2. The purpose of said thickening 13 is to
30 make it possible to position the bulbs simply and more tightly in holes 2. Preferably, one or more downwardly extending slots 14 are furthermore formed in the wall of the conical holes 2 of cultivation tray 1 so as to allow air which is trapped between the water surface and the
35 cultivation tray 1 to escape via said slot/slots. In addition, said slots 14 function as liquid channels when the water level is being changed, in particular raised

so as to immerse the bulbs 3 further in the water.

As already indicated above, the cultivation tray is also suitable for cultivating in particular lilies. In that case lily bulbs are inserted into the conical holes 2 of the cultivation tray 1 in the normal manner, after which the cultivation tray is placed on the water in upside-down position, that is, with the conical holes 2 narrowing in upward direction. This is done in the following manner. The lily bulbs are planted by being inserted in the conical holes 2 of the cultivation tray 1, with the cultivation tray 1 occupying a position in which the conical holes 2 narrow in downward direction. Then the cultivation tray 1 is placed on the water in upside-down position (that is, in a position in which the conical holes 2 widen in downward direction). As a result, the roots of the lily bulbs will come into contact with the water so as to stimulate their growth, whereby the water level is raised. More in particular, the cultivation tray 1 is thereby supported on underlying ribs 5 in the water reservoir (Figure 3).

It is expressly noted that the cultivation tray 1 need not necessarily be used in a water reservoir which is filled with water. On the contrary, it has become apparent in practice that the use of the cultivation tray as a floating tray has several drawbacks: the weight of the material to be cultivated (bulbs) constantly increases as it continues to grow, and the cultivation tray will sink in the water reservoir as a consequence of the fact that it does not have sufficient buoyancy; furthermore the cultivation tray is easily pulled out of the water upon harvesting of the cultivated products.

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In order to overcome the above drawbacks, it is proposed to place the above-indicated cultivation tray into a

water-filled water reservoir, wherein anti-sinking means are provided in the form of preferably at least one rib formed on the inner surface of the water reservoir. It is recommended to form the rib on the bottom of the water reservoir, whether or not as a continuous rib, for example by welding when the reservoir is made of a metal, for example aluminium, or by forming the rib in one piece with the reservoir when the reservoir is made of plastic material. Also glueing of the rib may be considered. In another preferred variant, the cultivation tray comprises a rib which projects downwards from the underside thereof, which rib can be supported on the bottom of the reservoir so as to prevent the cultivation tray from sinking.

Figure 4 shows a water reservoir 6 provided with at least substantially 1-shaped ribs 7, seen in cross-sectional view. In order to ensure that the water level is the same in all the compartments of the water reservoir 6 that are formed in this manner, water holes 8 are formed in the ribs 7, so that the compartments are in water communication with each other. Ribs 7 not only function to prevent cultivation trays 1 which are placed in the water reservoir 6 on ribs 7 from sinking, but also to enhance the rigidity of the water reservoir 6. In one preferred variant, the water reservoir 6 is transportable (mobile) and/or provided with a water inlet 9 and a water outlet 10 in the its bottom. The water level is indicated at 11.

In order to prevent the cultivation tray(s) 1 being pulled out of the water reservoir 6 upon harvesting of cultivated products, the water reservoir 6, in this case one of the ribs 7 thereof, is provided with a section or securing plate 12, which secures the underlying cultivation tray(s) 1 against being moved in upward direction during harvesting.

CLAIMS

1. A cultivation tray for cultivating breeding material such as seeds, bulbs, cuttings, plants or the like, using a growth medium, which cultivation tray comprises at least one downwardly narrowing through hole for containing the breeding material therein, characterized in that at least the wall of the hole is made of such plastic material that the material to be cultivated can be clampingly received in the hole, at least substantially without being damaged, by local deformation of the wall, whilst the wall is at least substantially impenetrable to roots of the material to be cultivated.
2. A cultivation tray according to claim 1, wherein said plastic material is polystyrene.
3. A cultivation tray according to claim 2, wherein said polystyrene is $(\text{CHCH}_2\text{CHCH}_2\text{CHCH}_2)_n$, in particular having a volume weight of 20 - 100 g/l, more in particular 40 - 60 g/l, even more in particular about 45 g/l.
4. A cultivation tray according to claim 1, 2 or 3, wherein said at least one hole is conical.
5. A characterized in that according to any one of the preceding claims 1 - 4, wherein said cultivation tray is provided with several holes, preferably 100 - 400 per m^2 (irises), 250 - 600 per m^2 (tulips), 50 - 250 per m^2 (lilies).
6. A cultivation tray according to any one of the preceding claims 1 - 5, wherein the specific weight of the cultivation tray is $< 1 \text{ g/cm}^3$.

7. A cultivation tray according to any one of the preceding claims 1 - 6, wherein said cultivation tray comprises at least one rib extending from the underside of the cultivation tray.
- 5
8. A cultivation tray according to any one of the preceding claims 1 - 7, wherein the cultivation tray is suitable for the cultivation of lilies and/or hyacinths when turned upside down, in which position said at least one hole widens in downward direction.
- 10
9. A cultivation tray according to any one of the preceding claims 1 - 8, wherein the wall of the hole is provided with a thickening.
- 15
10. A cultivation tray according to any one of the preceding claims 1 - 9, wherein said cultivation tray is provided with at least one air slot extending in downward direction in the wall of said at least one hole.
- 20

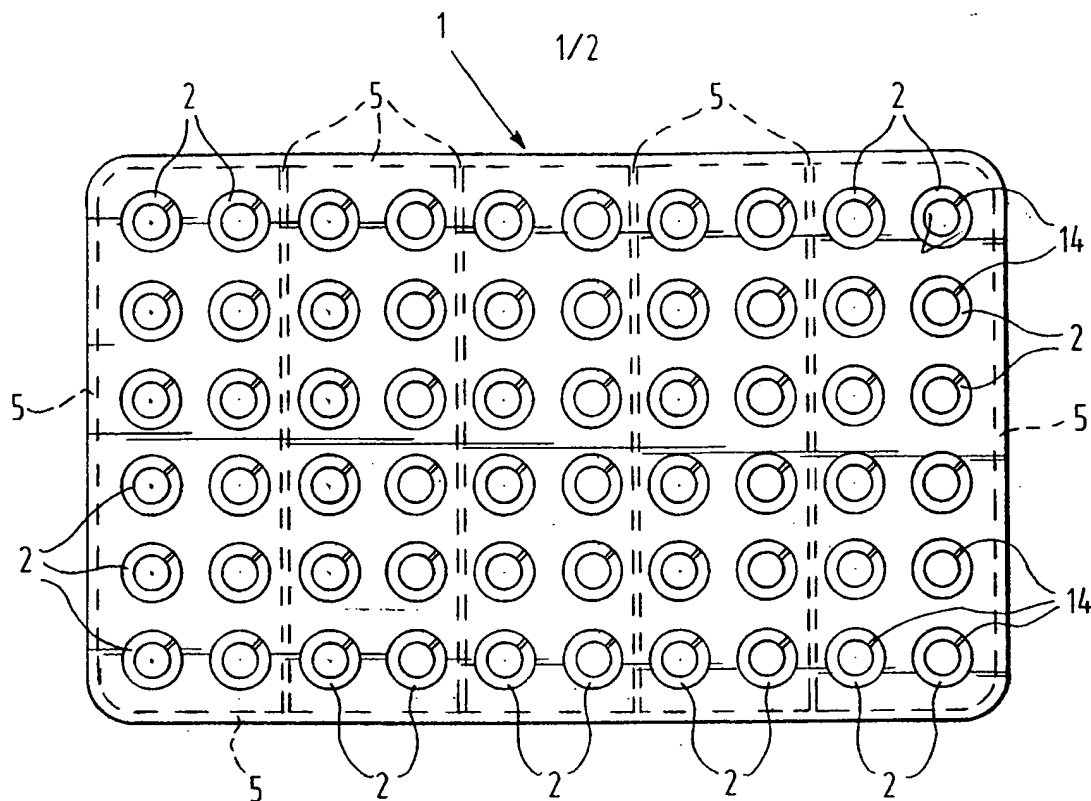


FIG. 1

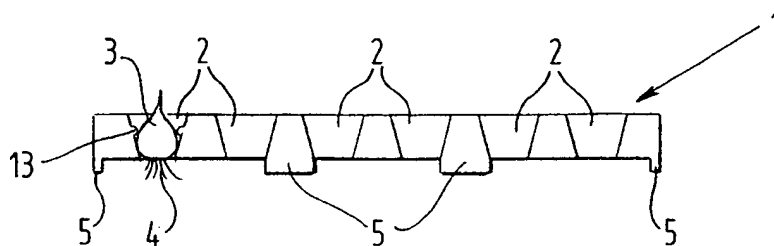


FIG. 2

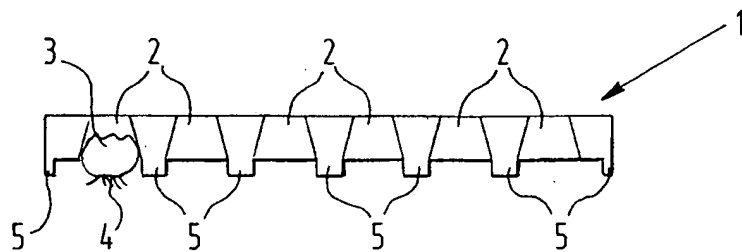
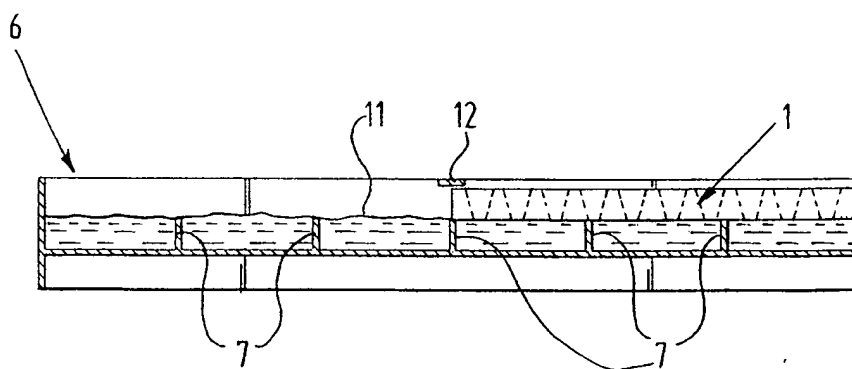
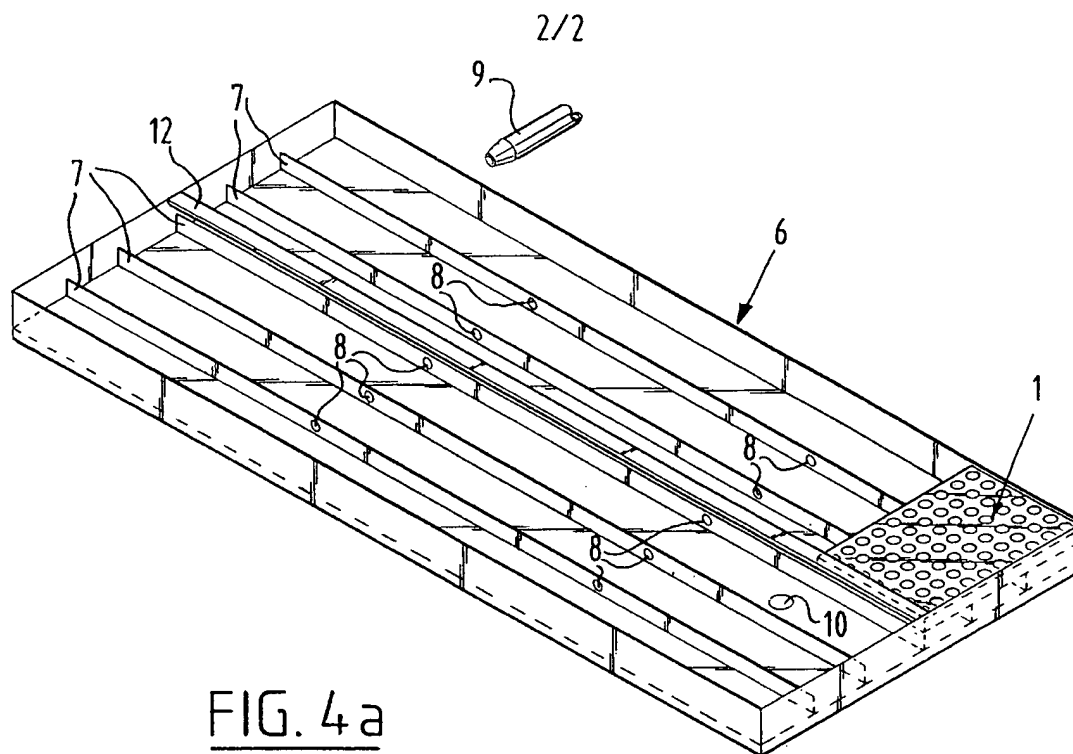


FIG. 3



INTERNATIONAL SEARCH REPORT

International Application No

PCT/NL 00/00100

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 A01G9/10

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 A01G

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C. DOCUMENTS CONSIDERED TO BE RELEVANT

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☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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